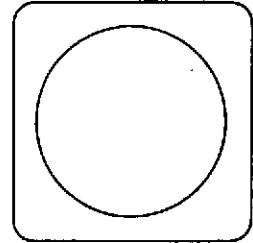


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EARTH SATELLITE CORPORATION
(EarthSat)



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January 4, 1974

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National Aeronautics and
Space Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

ATTENTION: Distribution

RE: Bi-Monthly Progress Report SR #141 ERTS,
Snow Enhancement: NAS521744

Gentlemen:

Earth Satellite Corporation (EarthSat) is pleased to submit a progress report for the period of November 1, 1973 to December 31, 1973. This will be the last Type I (Bi-monthly) report which will be prepared under the above contract. The next report to be submitted will be the draft text for the Type III (Final) Report. A Task Status Report can be referenced in Appendix A.

- A. TITLE: Facilitating the Exploitation of ERTS-
Imagery Using Snow Enhancement Techniques
(SR #141) - NAS5-21744
- B. PRINCIPAL INVESTIGATOR: Dr. Frank J. Wobber (P-511)
- C. CO-INVESTIGATOR: Mr. Kenneth R. Martin
- D. CONTRIBUTORS: Dr. Frank J. Wobber
Mr. Kenneth R. Martin
Mr. Roger V. Amato
Mr. Thomas Leshendok

(E74-10180) FACILITATING THE EXPLOITATION
OF ERTS IMAGERY USING SNOW ENHANCEMENT
TECHNIQUES Bimonthly Progress Report, 1
Nov. - 31 Dec 1973 (Earth Satellite
Corp.) 10 p HC \$3 00 CSCL 05B G3/13 00180
N74-14046 Unclas

E. SUMMARY OF ACCOMPLISHMENTS:

During this reporting period, extensive field observations were made to confirm ERTS signatures within the New England Test Area. Several hundred bedrock joint readings were recorded from outcrops and highway cuts within the field and fracture-lineaments mapped from ERTS-1 imagery were checked for surficial expression on the ground. These data are now being recorded in the form of polar plots as further indication of the structural validity of image-derived ERTS fracture-lineaments. A summary of the principal accomplishments follows:

- Procedures for conducting a regional mapping program utilizing snow-enhanced ERTS imagery have been conceptualized and will be incorporated into the Snow Enhancement Users Manual. The procedures for the quasi-operational application of ERTS imagery to complement an active mapping program in complex geological areas were summarized.
- Reviews of the reconnaissance ERTS Fracture-Lineament Map have been received and are being evaluated. Potential modifications to the map format (e.g., addition of major tectonic boundaries) are being considered as a result of these reviews.
- Selected fracture-lineaments were observed directly in the field; topographic expressions, correlation with predominant joint trends measured from nearby outcrops, etc. provided support of the structural validity of mapped lineaments.
- Numerous joint readings were acquired within the New England Test Area; a high density of readings were acquired within the Canaan Mt. Test Site. A previous field trip had enabled a high density of readings to be acquired for the Great Barrington Test Site.
- Summary plots of major joint directions within the New England Test Area have been compiled on 1:250,000 scale base maps and are being evaluated as a possible addition to the Fracture-Lineament Map.

- Leaf fall data (e.g. percentage of leaf canopy) has been compiled and analyzed. This data was acquired for several regions within the New England Test Area and is being used in the evaluation of seasonal influences on fracture detectability.
- Brief field observations of snow cover in the Maryland-Virginia Test Area were completed by the investigators following a recent snowfall. A summary of observed snow cover phenomena will be included within the final report.
- A preliminary evaluation of snow cover as an aid for detecting lithological differences has been completed. Results indicate that snow cover increases tonal differences between land use or vegetative types which are indicative of regional lithological differences. A more complete account of these findings will be included within the Final Report.
- Many portions of the Final Report are complete in draft form. Written supplements will be added during the next reporting period to assure a complete and comprehensive final product.

F. SIGNIFICANT RESULTS:

The procedure for conducting a regional geological mapping program utilizing snow-enhanced ERTS-1 imagery has been summarized. While it is recognized that mapping procedures in geological programs will vary from area to area and from geologist to geologist, the investigators believe that the procedure tested in this project is applicable over a wide range of mapping programs. The procedure is designed to maximize the utility and value of ERTS imagery and aerial photography within the initial phase of geological mapping programs. Sample products which represent interim steps in the mapping formula (e.g. the ERTS Fracture-Lineament Map) have been prepared. A full account of these procedures and products will be included within the Snow Enhancement Users Manual.

G. PROBLEMS:

A request for re-instatement of the standing order for ERTS coverage of the Maryland-Virginia Test Area has been submitted to the Technical Monitor. The standing order for this area had been inadvertantly discontinued.

H. RECOMMENDATIONS FOR TECHNICAL CHANGES:

None.

I. CHANGES TO STANDING ORDER FORMS:

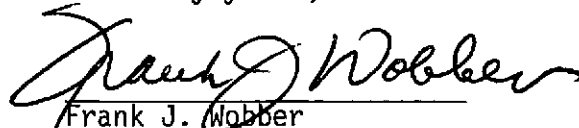
See section G Above.

J. OVERVIEW OF INVESTIGATION:

Recent field investigations have confirmed the structural validity of many ERTS fracture-lineaments through direct field observations and supporting bedrock joint readings. The fracture-lineaments have been recorded on a 1:250,000 ERTS photobase map of the New England Test Area. The map is designed to serve as a general structural reconnaissance map and can provide an effective base for geologists conducting preliminary mapping. Such a map could be particularly valuable for geological studies in complex regions where little fracture data is available.

Questions concerning this report should be directed to the undersigned at (202) 223-8100.

Sincerely yours,



Frank J. Wobber
Principal Investigator
Geosciences and Environmental
Applications Division



Kenneth R. Martin
Co-Investigator
Geosciences and Environmental
Applications Division

SIGNIFICANT RESULTS

November 1, 1973-December 31, 1973

The procedure for conducting a regional geological mapping program utilizing snow-enhanced ERTS-1 imagery has been summarized for general reference. While it is recognized that mapping procedures in geological programs will vary from area to area and from geologist to geologist, the investigators believe that the proposed procedure is generally applicable over a wide range of mapping programs. The procedure is designed to maximize the utility and value of ERTS imagery and aerial photography within the initial phase of geological mapping programs. Sample products which represent interim steps in the mapping formula (e.g. the ERTS Fracture-Lineament Map) have been prepared. A full account of these procedures and products will be included within the Snow Enhancement Users Manual.

APPENDIX A

APPENDIX A

TASK STATUS REPORT

TASK	STATUS	COMMENTS	
PHASE I			
1.0	Establish Techni- cal Interface with NDPF	Completed 6/30/72	Meetings held with the scientific moni- tor: ERTS-simulation U-2 aircraft imagery analyzed.
2.0	Assemble Geologi- cal Maps and Snow Cover Data	Completed 10/31/72	Subscription to New England Climatologi- cal Data: State geological maps of Massachusetts, Connecticut, Vermont, New Hampshire, and geological quadrangle maps for western Massachusetts purchased and analyzed.
3.0	Select and Estab- lish Snow Points	Completed 2/28/73	A comprehensive net of weather stations has been organized. Physical ground points for light aircraft survey have been minimized.
4.0	Base Map & Under- flight Preparation	Completed 10/31/72	Base map scale determined: Other New England investigators contacted.
5.0	Lineament Map Pre- Preparation	Completed 8/30/72	Radar imagery of Massachusetts, Connecti- cut, and Rhode Island was intensively analyzed to prepare geological lineament maps of the test area.
6.0	Snow Cover and Snow Melt Survey	Completed 12/31/72	Survey package designed and sent to news- papers in low density snow depth reporting areas. Readers indicating interest have been supplied with snow-depth reporting materials.
PHASE II			
7.0	Select & Analyze Snow Free ERTS Imagery	Completed 2/28/73	All ERTS-1 imagery of the test area ana- lyzed upon receipt. Images 1096-15072-5 & 7 and 1096-15065-5 & 7 of the New Eng- land Test area and 1062-15190-5 & 7 of the Maryland Test area are being enlarged to a 1:250,000 scale to serve as a photo base map.

TASK	HEADING	STATUS	COMMENTS
2.0	Analyze Snow-Covered Imagery	Completed 8/31/73	All ERTS-1 snow-covered of the test area analyzed. Intensive analysis of frames 1132-15074, 1168-15065, 1204-15072, 1204-15074, 1258-15073 and 1258-15080 has been conducted. U-2 snow-covered imagery also analyzed.
3.0	Prepare & Submit A Preliminary Data Analysis Plan	Completed 12/31/72	A Data Analysis Plan has been submitted and approved by the ERTS Contracting Officer.
PHASE III			
1.0	Modify Manual Optical & ADP Enhancement Techniques.	Completed 2/28/73	A re-evaluation of techniques and approach has been conducted. No major changes were necessary - minor modifications have been integrated.
2.0	Process ERTS Imagery Though Last Snow-Covered Period.	Pending evaluation of ERTS CCT processing	Automatic processing of ERTS CCT's is underway. Seasonal influence on fracture detectability is being studied.
3.0	Prepare Final Report	Underway	The Final Report is being written as the experiment progresses. Sections I, II and III (Introduction, Background and Design) complete in draft form. Subsections in Section IV, V and VI have been prepared.
4.0	Prepare NDPF User Manual	Underway	A procedure for supporting geological mapping programs with ERTS image analysis has been developed. Processing of a variety of candidate illustrations for the Manual is underway.



- Completed Tasks

APPENDIX B

PROGRESS REPORT SUMMARY

Reporting Period: November 1, 1973 - December 31, 1973

CATEGORY: 8-Interpretation Techniques Development

SUB-CATEGORY: C-General

TITLE: Facilitating the Exploitation of ERTS-Imagery Using Snow Enhancement Techniques - SR #141: NAS5-21744

PRINCIPAL INVESTIGATOR: Dr. Frank J. Wobber (P-511)

CO-INVESTIGATOR: Mr. Kenneth R. Martin

SUMMARY:

Recent field investigations have confirmed the structural validity of many ERTS fracture-lineaments through direct field observations and supporting bedrock joint readings. The fracture-lineaments have been recorded on a 1:250,000 ERTS photobase map of the New England Test Area. The map is designed to serve as a general structural reconnaissance map and can provide an effective base for geologists conducting preliminary mapping. Such a map could be particularly valuable for geological studies in complex regions where little fracture data is available. A procedure for conducting a regional geological mapping program utilizing snow-enhanced ERTS-1 imagery has been developed. While it is recognized that mapping procedures in geological programs will vary from area to area and from geologist to geologist, the investigators believe that the proposed procedure is generally applicable over a wide range of mapping programs. The procedure is designed to maximize the utility and value of ERTS imagery and aerial photography within the initial phase of geological mapping programs. Sample products which represent interim steps in the mapping formula (e.g. the ERTS Fracture-Lineament Map) have been prepared. A full account of these procedures and products will be included within the Snow Enhancement Users Manual.